CHARACTERIZATION AND CONSERVATION OF LOCAL PIG GENETIC RESOURCES IN SEKHUKHUNE DISTRICT OF LIMPOPO PROVINCE

By

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ABBREVIATIONS

ADFI - Average daily food intake

ADG- Average daily gain

BCS - Body Condition Scoring

CAES – College of Agriculture and Environmental Science

FAO - Food and Agricultural Organisation

FCR - Feed Conversion Ratio

PDI - Previously Disadvantaged Individuals

PTO- Permission to occupy

UNEP – United Nations Environment Programme

WWL-DAD- World Watch List for domestic animal diversity

ABSRACT

A pig genetic resources study was conducted in five municipalities of Sekhukhune with the aim of characterising pig genetic resources in communal farming systems. A total of 52 pig farmers were interviewed using a structured questionnaire instrument. Of the 52 farmers 65 percent were subsistence, 27 percent back-yard and 8 percent emerging farmers. The primary data collected included demography, production practices, herd structure, feeds and feeding, breeding practices, marketing, and conservation methods. Two indigenous pig farmers and one exotic pig farmers were selected for purpose of measuring growth and other linear traits of piglets over a period of two months.

Four hundred and nine (409) pigs were used for body measurements of which 124 were from emerging farms, 71 from subsistence and 206 from back-yard farms. Data was analysed using SAS Package (SAS, Version 9.3). Demographic representation of farmers showed 79 percent of farmers being males, 85 percent married. With 50 percent between the ages of 55-64; 60 percent owning the farms and 83 percent Northern Sotho speaking farms. The majority of farmers (39 percent) had secondary education with 81 percent trained in production and over eight years of farming experience.

The objective of farmers raising pigs was mainly for selling at a frequency of 60 percent. Over 70 percent of the farmers had a good grasp of controlling internal and external parasites. However, over 80 percent of the farmers did not vaccinate or get advice from extension officers. When comparing the production systems, there was no variation in the number of young pigs produced. Only 13 percent of the emerging farmers and eight percent in back-yard had proper housing. Only 10 percent of the farmers had financial assistance. That led to only 10 percent of the farmers able to feed complete rations to their animals. Cross breeding has been practiced within communal areas by over 75 percent of the farmers. Over 15 percent bought boars from commercial farmers. This practice enabled them to sell their piglets to private buyers at 50-60 kg at an average price of R500 – R1000. Though the value of indigenous breeds was rated high by over 63 percent the size and price compelled them to cross-breed. An establishment of an indigenous breeding program is highly recommended.

Key words: Indigenous pigs, exotic breeds

CHAPTER 1
INTRODUCTION

1.1 Background of the study

Southern Africa has a range of genetically varied pig breeds which played an essential part in the socio economic welfare of the country. Though, there has been an introduction of exotic breeds that subsequently infest and degenerate the indigenous gene (FAO 2007).The chaotic introduction of exotic breeds in the communal farming system led by demand of larger breeds.

A clear understanding of breed characteristics is a vital guide to a proper livestock development and breed production (FAO, 2007). The rural and marginalized areas of South Africa including Sekhukhune farmers whose key objective through pig farming is to address food security. A number of animal projects were introduced through Land Reform programmes and emerging pig projects were also established through government programmes in the district. The production practices associated with pig farming is characterized by poor housing facilities, feeding the animals with farm waste and minimal disease control. Pigs are raised under traditional system and fed according to local resources (Munyai, 2008). Lack of knowledge and management practices compromised good performance of pigs for the desired market. Existing genetic diversity in terms of their number and distribution has led to underutilization and dilution of certain breed without specific objective.

In the tropical countries, animals are primary source of the farming systems and they played varies roles (Saadullar and Saad, 1998). Pigs owned by resource poor farmers mostly scavenge kitchen wastes, fruit residual, roots and tubers and slight amounts of grains and grain residual and everything edible in the neighbourhood (Saadullah and Saad, 1998). Under those difficult conditions indigenous breeds are more resistant to diseases and environmental stress. However, productivity is rather low due to poor management practices (Saadular and Saad, 1998). Indigenous animal genetic resource can be productive without the need for high value inputs. Pigs as part of the indigenous animal genetic resources in tropical countries were raised without any religious barriers for decades. They have been raised under conditions which initially deem to be primitive (Serres, 1992). These breeds are small in size, low reproductive rate and with poor growth performance compared with those in temperate countries. In this study, the view is taken that cross breeding of pigs farming systems concept is practiced without a clear understanding

1.2 Problem Statement

There are a number of uncharacterized breeds kept by farmers. As a result of the arrival of exotic breeds in communal areas and without good management practices. Farmers applied cross breeding without maintaining respective line breed of a specific breed. The production practices associated with indigenous pig farming is characterized by poor housing facilities, feeding the animals with farm waste and minimal inputs for disease control in area of Previously Disadvantaged Individuals (PDI). Breed type in rural area fail to address food insecurity due to poor management practices. Pig farmers in the communal area judged pig production by the quantity rather than quality. Little research has been done to establish the type of indigenous breeds that still exist in rural areas and the socio-economic impact on indigenous pigs.

1.3 Hypotheses

The null hypotheses of this study were:

- The pigs breeds found in Sekhukhune District Communal farmers do not conform to the characteristics of specific known breeds.
- There is a decline of indigenous pig breeds in Sekhukhune District.
- Farmers are practicing haphazard breeding methods of pig production in Sekhukhune District.
- No conservation approach is applied to prevent extinction of indigenous pig breeds.

1.4 Purpose statement

Most farmers in the communal area keep different pig breeds without proper breeding practices. Farmers applied cross breeding without maintaining respective line of a specific breed. There are number of non-descript pigs in the rural area and little or no awareness of sustainable conservation of animal genetic resource strategies. The information generated in the present study will assist the policy makers at national level and enforce the review of policy that will be effective in preventing extinction of indigenous pig breed in communal areas. The identified challenges will lead to the recommendations of possible solutions that will be effective in pig production and conservation approach. The implementation of identified alternatives will lead to sustainable pig productions which will result to food security to the communal communities.

1.5 Research Questions

The following research questions were addressed:

- What type of pig breeds are found under Sekhukhune district area?
- Do indigenous pigs still exist around the area without risk of being extinct?
- Do pigs kept under adequate management practices fulfil the requirements for food security?
- Which conservation systems are used to preserve indigenous pigs?

1.6 Aim and Objectives

1.6.1 Aim of the research

The research aimed at the description of pig breeds and conservation strategies of indigenous pig breeds and further assessed whether the said strategies are socially, environmentally and economically sustainable.

1.6.2 Main Objective

To characterize pig genetic resources in the communal farming system.

1.6.3 Specific Objectives

To determine pig genetic resources breeding practices in the communal area.

To identify conservation methods used in pig production under the resource poor farming systems.

To identify challenges faced by poor resource farming systems.

To investigate the major social-economic determinants of success under resource poor farming systems

1.7 Importance of the study

The research will contribute towards a better understanding of pig breeds and conservation strategies in Sekhukhune District. The generated information will further contribute to body of knowledge and pig industry in relation to genetic and conservation of indigenous pig genetic resources. The outcome will further help government policy makers on the review of current policy that regulates the genetic and conservation of indigenous pig genetic resources.

1.8 Ethical consideration

Research committee of the University approved the study (approval number 37126542). After the approval application for ethical clearance by CAES ethics committee, the actual data were collected. Farmers were asked to participate voluntarily and no farmers was forced to partake in the study. The actualities of the study were elaborated to the farmers afore the interviews and the consent forms signed by farmers before the survey started. Partakers were informed of their rights, assurances of confidentiality were given and partakers were informed that their identity would be kept anonymous. Bio-security measures were applied (disinfection in each farm before entering the pig units). The farmers were made aware that the information they share will be treated confidentially. The questionnaires were not anonymous; however, the participant details are treated as confidential.

CHAPTER 2

LITERATURE REVIEW

2.1 Status of genetic resource diversity of animal in underdeveloped countries

Regardless of the significant role of animal resource diversity, a number of adapted breeds bred domestically under a variety of environments in the previous century are at the brink of extinction (FAO, 2000). There is less intervention regarding the denegation of animal genetic resources which is more pronounced than in crops due to quite a limited gene pool. According to (Rege and Gibson, 2003), numerous livestock breeds facing extinction today are in developing countries. The erosion of genetic variation within a certain breed is disadvantageous not only from the point of view of culture and conservation but also for value due to the fact that lost genes may be economically beneficial in future (Hetzel and Drinkwater, 1992). Unfortunately it is impossible to replace the diversity of animal genetic resources after it has been lost (FAO, 2000). There are two factors that cause extinction of livestock breeds namely: human-association factor and stochastic factor (Frankham *et al*., 2004). Human associated factors are directly or indirectly related to impact cause by over population of human while stochastic factors are naturally occurring fluctuations experienced by small population namely environmental, catastrophic, demographic and genetic origin (References).

It has been reported that environment differences causes variation in phenotype among certain breeds (Hartl, 2012). Loss of genetic diversity impart negatively on food security, particularly among the communal farmers. A number of domestic animal breeds in the world is believed to be facing extinction as a result of the loss of genetic diversity (Cardellino, 2004; FAO, 2000). In order to monitor the gene flow of populations in future, a survey of genetic variation is essential for the conservation of species and determination of inbreeding and cross breeding (Kunene *et al.,* 2007). Genetic diversity is variety of alleles and genotypes present in a population which is reflected in morphological, physiological and behavioural variations between various species (Frankham *et al*., 2002). Hendrick (2001) classified genetic diversity as neutral, deleterious or adaptive. Expected gene diversity is the most popular parameter to measure diversity within a population. Nei (1973) defined expected gene diversity as the probability that two alleles chosen at random from the population are different. The basis of productive and reproductive traits which of concern in conservation and biology is quantitative genetic variation. Data analysis from families permits estimates of the quantity of additive genetic difference or heritability for polygenic traits to be acquired (Falconer and Mackay, 1996).

2.2 Breeding practices

According to Gillespie and Flanders (2010), the breeding system used depends on particular livestock operation in which the animals are bred. Different methods of breeding have been identified in the literature (Gillespie and Flanders (2010). The following are the example:

Inbreeding: mating of related animals. This refers to how closely related are the animals.

Line-breeding: mating of animal that are more distantly related to trace back to one common ancestor.

Out-crossing: mating of animals of different families of the same species.

Grading up: repeated mating of thoroughbred males to inferior females.

Crossbreeding: mating of two animals from different breeds.

Inbreeding causes a change in allele frequency that can reorganize alleles into genotype and a population that is inbred increases frequency of the homozygote (Hedrick, 2011). The animals with the greatest value are used as contributor of genes to offspring. Selection of best breeding values contributes best genes to the next generation (Bourdon, 2000). Preferences of consumers for certain animal products has a detrimental effect on indigenous animals (Rege and Gibson (2003).The type of production system used determines the occurrence of both deliberate and random breeding (Nakai, 2012). It is difficult to control the breeding of pigs that are not housed in proper building because they roam around. In rural areas of Kenya (Kagira *et al*., 2010) and RSA (Madzimure *et al*., 2013), most of the replacement stock for breeding purpose are bought from the community members because most farmers sold their pigs within their communities.

The approaches of genetic conservation

Considering the significance of animal genetic resources the Food and Agricultural Organisation (1998) suggested that governments provide support for livestock development programmes that involves replacement and crossbreeding that doesn't accelerate the extinction of precious or irreplaceable indigenous breeds (Pattison *et al*., 2007). Conservation is an integrated effort that develops practical approaches to prevent the extinction of species (Primack, 2008). Two conservation approaches for the preservation of genetic resources of farm animal are ex-situ and in-situ. Ex-situ conservation approach consist of methods such as cryopreservation and live animal designed locally (e.g. Experimental farms) while in-situ refers to the uninterrupted breeding of a various set of population by stock owners in the agro ecosystems where an animal population developed.

The major benefit of in-situ approach is that it preserves both the genetic material and the processes that caused the variety. Food and Agricultural Organization emphasized the significance of community participation in properly erected in-situ conservation projects (FAO, 1998). Socio-economic changes such as war and natural disaster and use of home-grown breeds, it is imperative to assess genetic diversity that found within the breeds (Kunene *et al*., 2008, 2009). The preservation of home-grown animal resources has been recommended as a method to decrease the damage in diversity in livestock breeds through disappearance (Notter *et al*, 2007)

The decline of genetic diversity amongst and in animal breeds has led to the need of conservation of certain breeds (Ramsay *et al*, 2000).The production industry, lack of education and awareness on the part of the farmers has contribute to crossbreeding and inbreeding processes of the indigenous breeds. The conservation of home-grown animal resources has been recommended as a method for reducing the decline in diversity of livestock breeds through extinction (Notter et al, 2007) Prevention of extinction and conservation of livestock breeds is vital for the future health of the animal industry in the whole world. The well-preserved animals are a useful resource for genes that can allow sustained genetic improvement as well as enable adaptation to varying breeding objectives and environments (Notter, 1999).

2.4 Need for conservation of indigenous genetic resources

Conservation can be defined as the controlling of animal genetic resources to produce the maximum sustainable advantage for the existing generation and to conserve the potential for the coming generations (Hodges, 1992; United Nations, 1994). Conservation refers to sustainable, utilisation, maintenance and improvement of genetic resources are sustained in unchanging condition. (Hodges, 1992; United Nations, 1994). FAO is developing a world-wide programme with the objective to categorise, monitor and describe farm animal genetic resources to enhance their short-term use and to guarantee long term accessibility (Strauss 1994). In line with the concept of the 'Conservation of Biological Diversity' FAO's approach aims to expedite national action plans. The activities, which are coordinated through a co-ordinating office in Rome, consist of the following (Hammond, 1994):

- Improvement of a world-wide information system
- Implementation of world-wide gene bank
- Launching of an awareness

- Harmonization of world-wide research activities to assess genetic variety
- Extension of training and communication

Storing genetic material in the form of frozen semen or frozen embryos could become a practical strategy to conservation of genetic stock whose survival is at risk (Smith, 1984b). Smith, 1984b) studied the efficiency of different methods for lessening the decline of genetic variability. According to the author, the freezing of semen became the economical method of conservation for a period above five years. Rotational use of frozen semen from different sires on each other's daughter would assist to lessen inbreeding and drift in gene frequencies (smith, 177). It is essential to obtain a complete description of the characteristics of indigenous breeds, together with a characterization of the environments to which they are adapted (Hodges, 1984). As most of indigenous breeds are spread across many countries, genetic resources management requires cooperation in exchange of germplasm for all species by adhering to quarantine precautions. (Acharya, 1982). There is a need for conservation of a number of breeds where numbers are seriously diminishing.

Conservation need is massive when size of population is getting smaller, especially when the rate of decrease is fast. Most of time conservation refers to the storing of semen and embryos. The WWL-DAD (FAO, 1993) stated that conservation alone will not deliver real programmes for providing the best use of animal genetic diversity and present universal action of conservation as follows:

- Description and recording of all breeds and their depiction and classification.
- Observing sequential breed count and frequently reporting a list of those breeds presently threatened.
- Accelerating the immediate use of as many breeds as possible.
- Storing as many typical models of as many breeds as possible.
- Executing education and training programmes in the field of conservation genetics and competent on the farm conservation techniques.
- Creating a coordinated international system to manage this set of procedures and get maximum involvement of each

of the many intervening agencies which are necessary to the success of this programme.

2.5 Pig breeds found in Africa.

Indigenous breeds refers to breeds that are found only in one country (FAO, 2007). In various African countries, pigs have not been classified into particular breeds. The classification of breeds requires understanding of genetics that can be successfully measured in and amongst populations (Nei *et al,* 1983). The situation is further confused in some areas by interbreeding with imported exotic strains (Holness, 1991). There are common breeds found in Africa namely Winsnyer, Kolbroek, Mukota, Bakosi, Ashanti dwarf and Wart hog.

The indigenous pigs in South Africa have been classified by Mason and Maule (1960) into two different types, namely, Windsnyer and Kolbroek.

The Windsnyer is found throughout Zimbabwe and parts of Mozambique. The term Windsnyer (wind-cutter) originate from its conformation, characterised by slim body, elongated nose and sharp back. The kolbroek type is a stout animal with a diminutive muzzle and dished face, which appears to be restricted to South Africa. The Kolbroek is extremely hardy and survives by scavenging making it ideal for rural areas. This pig can survive on food low in nutrient such as cereal by-products efficiently. The pig shows good mothering ability and has less piglet mortality. In Zimbabwe, where the breed is more prevalent, it is reported that the meat more delicious than that of the exotic breeds (Eusobio, 1980).

Mukota pig which is an indigenous breed is found in Zimbabwe. It is well adapted to the prevailing environmental conditions (Holness and Smith, 1974). The pig is hardy, adapted to the local environment and reproduce on low planes of nutrition.

Bakosi pig is another indigenous breed found in the forest area of Cameroun and West Africa. They are hardy and can survive in harsh conditions (Epistein, 1971).

Ashanti Dwarf, which is found in Ghana, varied in colour but is usually black. These breeds are low in fertility, grow slowly and are considered by some authorities to be of Iberian ancestry (Epstein, 1971). They are hardy and some are trypano-tolerant. It has been reported that they were imported from the Mediterranean region by the Portuguese. Those that were trypano-tolerant were suggested to have had a more ancient ancestry (Payne, 1990).

The Warthog is also an indigenous breed with long legs. The body length is 1.5m and has a tufted tail. The skin is slate or clay coloured and naked except for a few bristly hairs. It possesses a mane that is continued along the mid-line of the back.

The muscle is broad with upward-curving tusks. They are found in several parts of Kenya, such as the Aderdare mountains and Mount Kenya, Tanzania, Uganda and as far west as Liberia (Eusebio, 1980).

Table 2. 1 Number of breeds or breed varieties per geographical region in the data bank (Mason, 1988)

	Buffalo	**Cattle**	**Goat**	**Horse**	**Pig**	**Sheep**	**Total**
USSR	1	50	20	59	27	135	292
Africa	8	175	59	35	8	133	418
N&C America	1	67	12	41	35	48	204
South America	2	45	11	22	17	17	114
Asia	63	200	147	88	142	232	872
Oceania	0	21	6	2	6	39	74
Total	75	558	255	247	235	604	1974

In the above table, not all entries were included (Mason, 1988). For example, those referring to a crossbreeds, a hybrid or collection of breeds were exempted. On the other hand, all strains of breeds as well as wild or feral species were included. Of the 1,974 entries in the data bank, 455 are defined as a variety, sub-variety or a strain and 75 as wild or primitive.

2.6 Pig production systems

In the tropical region, backyard pig production system plays an important role as a main source of revenue. Number of pigs raised by small farmers are of the local type (Saadullah and Saad, 1998). Small scale pig producers in the rural areas are grouped into three categories with regard to their roles in rural pig production systems:-

- Those who produce piglets and raise them to market weight.
- Those who buy weaned piglets and feed them to market weight.
- Those who keep the service boars for hire.

The majority of pig raisers in the rural areas are those who buy weaned pigs and raise them to market weight (Saadullah and Saad, 1998). Solarte *et al*, (1998) have identified three basic pig rearing systems in Columbia, which are:-

- Farmers producing their own pigs, that is, those who have the means to buy the piglets and the feeds (concentrates)
- Farmers producing their own pigs, but with a partner supplying the commercial concentrate

- Those who have produce piglets from their own sows, but have inadequate resources to buy feeds. In this case a strategic partner supplies the feeds and after selling the pigs, the cost of inputs is deducted and the profit is divided between the partners
- Farmers who produce pigs for a partner. In this system the strategic partner provide the piglets and the feeds and the farmer manages the animals. The partners share the profit after deducting the costs.

According to Bembridge (1987), pig production plays an essential role in an integrated farming system. A total of 15% to 20% of regional pig population comes from large-scale pig farms (Northoff, 2006). The commercial sector produces most of the slaughter pigs for the commercial market (Steinfeld *et al*, 2006). The portion of commercial pig production within total pig production varies among countries. The commercial farms are well-resourced, well-controlled, and have a great productivity level. Yorkshire and Landrace are examples of exotic breeds that are kept in this system (Borin, 2006). Pigs produced under intensive systems are supplied with commercial feed and vaccinations and biosecurity measures are applied with extreme caution.

There are variations in types and scales of production between different countries in the region. The contribution from medium scale farms is 15% of total pig production and they also house a husking mill, or a small feed-mixing facility (Villar *et al*., 2002). The pigs produced here are usually crossbreeds and exotic breeds. Feed used in this system are home-made concentrates or commercial feed. However, because of the high costs for feeds, only very resourceful farms can survive at this scale of production in the long term (Steinfeld *et al*., 2006).

2.7 Pig production management

The welfare state of an animal is conventionally defined as satisfactory by scientists and legislators when the animal can cope with the environmental challenges. Challenges which may be physical, emotional or biological induce stress and immune-suppression and increase susceptibility to infectious disease that can have prolonged effects (Webster, 2013). Pig production is highly intensive farming programme with specialized housing and management. The economics of pig production are dominated by feeding costs which vary between 75% - 85% of overall expenses (Boyazoglu, 1997). The popular perception of pig is that that they are dirty and are susceptible to heat stress. These perceptions are erroneous and opposite from production point of view.

Pig got the reputation of being dirty because they wallow in the mud. Pigs will not overeat if given proper feed and consume only the amount of feed they need. The characteristics of pigs determine the type of production that suits their needs. The type of building, health management and diets are designed to help pigs live healthy, comfortably and productive live (Herren, 2007).

Management has an overriding influence on the profitability of a pig herd. The producer must strive to integrate all the practices relating to the well-being and productivity of his animals (Holness, 1991). Payne (1990) indicated that successful management of pigs in any part of the world depends primarily on intelligent planning that is based on knowledge of the biology of the pig. In most tropical countries, especially in the past, the indigenous producers did not attempt to obtain maximum productivity from their pigs, but managed them primarily as scavengers.

Most pigs are allowed to roam and forage with little and or no feed supplement. Pig production under good management can undoubtedly play and important economic role in an integrated farming system (Bembridge, 1987). As pigs are unable to sweat, it is important that shade and water should always be provided, especially in hot and dry area. Modern pig management includes feeding, housing, control of diseases and other well-planned practices that are essential for increasing efficiency in pig production. In most developing countries, especially in remote areas, pigs are raised as scavengers. Proper management practices are expended to secure maximum productivity (Eusebio, 1980). Individual households own pigs which are often kept under a scavenging system with little or no provision of housing, feeding or healthcare (Paul and Saadullah, 1991).

2.8 Housing of pigs

Buildings help to confine pigs and protected them from the effects of environmental elements. At different stages of their growth, pigs have diverse environmental and physical requirements, thus, pig houses come in a wide range of structural plans (Munyai, 2008). Pig require a warm and dry area to lie and feed. They also need to excrete and move about. The structure of the building must allow access to feed, stock handling and evacuation of excreta – preferably automatically. The building must also be constructed at minimal cost (Whittermore, 1980).

Traditionally pigs are kept in one of two ways: either penned in small enclosures made from wooden poles planted closely together and fed the household scrap or on the free range where they scavenge for their food. In many tropical countries, pigs are housed in an elevated batteries or pigsties. The house is made from cheap materials that are easily available in the region. The slatted floor is not ideal for a pregnant sow as she may slip through a slot and suffer abortion (Eusebio, 1980). The compartments are usually small and sows do not have enough space to walk freely for exercise (Eusebio, 1980). On the basis of the number of animals and their function (fattening, breeding, etc.) the number of pigsties may be increased (Losada *et al*., 1997). Producers in the tropical countries allow their pigs to wander and scavenge with little attempt to secure maximum productivity from the pigs (Eusebio, 1980). Most of the farmers house the boars separate from the rest of the animals while sows and piglets are kept together. The cleaning of the pigsties is carried out, on average, three times a week, and the few producers throw away the faeces, with only a small percentage using it as a form of organic manure for crops (Losada *et al,* 1997).

2.9 Feeding Management

The type and mode of feeding mostly influence the feed efficiency, growth rate, breeding efficiency, carcass quality and the general health of pigs. The selection of feeding period for pigs is based completely on nutritional value and economic considerations (INRA 1984; English *et al*, 1988). The restriction of feeds is generally practiced to improve carcass quality and feed efficiency while reducing production costs. Pigs kept individually have been proven to have desired feed intakes and therefore better performance than grouped pigs (Nielsen *et al*, 1996).

2.9.1 Effect of stocking rate and feeding space on growth and feed conversion

Lavers and Ferguson (2000 report that there were no major differences between the main effects of feed bins per pen and the number of pigs per on any production characteristics (Table 2.2). These authors concluded that feeder space and numbers of pigs per pen have no major effect on feed intake and growth because pigs are successful in adapting to their conditions by changing their behaviour.

Table 2.2 Effect of the number of feeder bins and pigs per pen on average daily food intake (ADFI), average daily gain (ADG) and feed conversion (FCR) in growing pigs *(Lavers and Ferguson, 2000)*

Bin Numbers	Numbers of pigs per pen	ADFOA (kg/day)	ADG (kg/day)	FCR
1	7	1.66	0.767	2.164
1	13	1.59	0.732	2.1722
2	7	1.58	0.727	2.173
2	13	1.47	0.686	2.143
3	7	1.59	0.728	2.184
3	13	1.55	0.728	2.1292
4	7	1.64	0.751	2.184
4	13	1.61	0.702	2.293

The purpose of feeding in pigs is to fulfil their nutrient requirements for growth. It has been found that pigs kept in groups do not ingest as much food as those kept individually and thus fail to meet their requirements (Morgan, 1996). The lack of substantial variety between the groups would suggest that the larger group reward for the reduced space by feeding for a longer period and feeding at night (Walker, 1991). Pigs within large groups learn to acclimatise to these constrain by adjusting normal patterns of behaviour. The base of feed resource for pigs is mostly foraging in small farm and consist of kitchen left-overs, fruit residuals, roots and tubers and small amount of grains, grain residuals and anything edible found in the vicinity (Saadullah and Saad, 1998)

2.9.2 Alternative feeds

In the use of non-cereal energy-rich feeds such as cassava major progress has been made (Machin and Nyvold Solveig, 1991), molasses (Preston *et al*, 1968) and sugar cane juice (Sarria *et al*, 1990). Preston, (1995) recommended that the future feed resources in small farms for non-ruminants animal in the tropics should not be cereals, but rather available local feeds which are made on the farm with reasonable advantage in viable production systems.

2.9.2.1 Cassava

Several authors (Job, 1975; Tewe, 1982 and Iyayi, 1994) have recommended the necessity of cassava for pig feeding, and the quality of cassava meal as worthy replacement for maize meal for all categories of pigs. Flour and peels of cassava could serve as a source of energy and can compare favourably with that of maize. Cassava leaves and stem contain 23% CP/kg DM. This compares favourably with that of soya bean meal, it is also rich in vitamins and amino acids profile (Khajarem *et al*, 1997). The foliage is low in sulphur comprising amino acids such as methionine and cysteine but high in lysine (Devendra, 1977).

2.9.2.2 Rice by-products

Farmers supplement rice residues with leaves of *Trichanthera gigantic* in diets of growing and lactating pigs in Colombia and Vietnam. Sarria et al. (1991) reported that the foliage of trichantera gigantic could be used to substitute up to 30% of the protein in diets of pregnant sows with significant reduction of feeds costs. The utilisation of fresh foliage of *Trichanthera gigantean* as additional to traditional diets for lactating and growing pigs resulted in great saving in cost of feed with no loss in performance (Nguyen Thi Hong Nhan and Van hon, 1999).

2.9.2.3 *Sugar cane*

There has been widespread use of by-products of the sugar cane industry such as molasses to replace cereals in livestock feeds. Sugar cane residues provide feed for non-ruminant and ruminant animals and has been recommended by Preston (1980, 1988) as a substitute to the use of cereal grains. Mena et al. (1981, 1982) demonstrated the utilization of fresh juice as the energy source in pig in Mexico which is now the basis of commercial pig production system in Columbia and other tropical countries (Sarria *et al*, 1990). It was reported by Shumecher *et al*. (1986) that pigs fed raw sugar diets had greater live weight gains, feed conversion efficiencies and dressing percentages while back fat thickness was considerably less, compared to those fed a conventional cereal-based diet.

2.10 Growth rate

Growth rate is measured as the increase in body weight with time, and is basically reliant on on the amount of food or total nutrient intake (Holness, 1991). There are major variances amongst the food ingestion of different breeds of pig and these influences their growth response per unit of food ingested. Only those feed nutrients that are digested can stimulate growth, body maintenance and production of milk.

The digestion of feed nutrients is influenced by disease, parasites and physiological disturbance in the digestive tract. Often such disturbances result in poor growth (Eusobio, 1980). Naturally weaning is practiced by most small holder farmers approximately after 56 to 60 days (Scherf, 1990). Indigenous sows can produce enough milk to support rapidly growing piglets. Consequently low weaning weight of home-grown pigs cannot be attributed to insufficient supply of milk, but shows their inborn characteristics of slow growth. Indigenous pigs which are slow growing can be used where the farmers do not have the priority of achieving rapid growth rates, such as in some rural areas, where pigs are mostly kept to provide meat for household consumption (Chimonyo *et al*, 2001; Kanengoni *et al*, 2002).

Increasing the number of piglets per female per year and reducing the interval between farrowing by weaning the animal early is a common practice in pig production (Koketsu and dial, 1997; Koketsu *et al*, 1998). Sow productive cycle can also be minimised during the lactation period (Mota *et al*, 1999) by establishing gestation during lactation, without affecting the performance of dam or her litter (Mota *et al*, 2002). This will result in piglets continuing to suckle while the mother is pregnant, thus reducing the productive cycle, attaining a higher number of farrowing per female per year (Kirkwood and Thacker, 1998).
Reproductive activity such as sexual behaviour and weaning to oestrus intervals are adversely affected by high ambient temperature. For example, seasonal effects have been observed on the rate of growth, development and the attainment of puberty of exotic gilts reared in the humid tropics of Nigeria (Steinbach, 1976) and Australia (Tomes and Nielsen, 1979). It is suggested that high ambient temperatures during lactation cause a decrease in luteinizing hormone pulse frequency and that this is liable for the delay in re-mating after weaning (Barb *et al*, 1991). Poor nutrient intake during the hot season coupled with unstable ambient temperature might be the lead to lower fertility (Barb *et al*, 1991).

Unsatisfactory weaning weight in the tropics and undesirable correlation between weight gain and ambient temperature has been observed for exotic breeds suggesting a direct or indirect effect of climate on milk yield in heat stressed sows (Steinbach, 1971). Exotic sows exposed to high ambient temperature during last few weeks of pregnancy and lactation produce less milk than their counterparts kept in thermo- neutral condition (Black *et al*, 1993). Els (2002) indicated that piglets have a slow growth rate between birth and weaning but this increases significantly between weaning and 6-months old.

Towards 12-months of age the growth rate slows down again. The author indicated that season of birth has a significant influence on mass at different ages. It seems as if there is a tendency of seasonality in fertility ((Table 2.3)

Table 2.3 Summary of birth, weaning and 6-month weights of piglets (kg) born between April 1997 and April 2000 *(Els (2002).*

	Birth		**Weaning**		**6-Months**	
	Summer	**Winter**	**Summer**	**Winter**	**Summer**	**Winter**
Boar1997/8	2.16	1.36	12.02	9.45	39.43	50.96
Boar1998/9	1.21	1.41	16.7	10.08	52.79	41.41
Boar1997/8	1.54	-	14.89	-	-	-
Boar1997/8	1.56	1.32	9.69	8.38	42.98	58.00
Boar1997/8	1.06	1.38	16.53	9.0	59.54	40.62
Boar1999/00	1.44	-	14.68	-	-	-

2.11 Weighing for monitoring growth of piglets

Pig owners in the rural area do not weigh their pigs and this makes it difficult to assess the need of providing supplemental feed (Munyai, 2008). For the resource poor farmers, the use of method for assessing the condition of animals is labour intensive and costly (Nsoso *et al*, 2003). Body Condition Scoring (BCS) could be used by small-scale resource poor farmers. Body Condition Scoring method is a valuable description tool for animals centred on an easy practical indicator closely associated with the body conformation. There is a solid correlation between body conditions and weight change. It has been observed that as body condition score increase, mass also rises and vice versa.

Body mass is a frequent recorded variable in animal research (Fourie *et al*., 2002). There is general belief that live weight and body condition are closely related to the productivity of farm animals (Majele-Sibanda *et al.,* 2000). Body weight has been used mostly to evaluate growth. Other measurements that are commonly used in cattle include heart girth, wither height and body length (Fourie *et al.,* 2002).

2.12 Pig production constraints

The setback in pig production can be attributed partly to diseases, environment, poor nutrition and lack of technical expertise (Eusebio, 1980). Animals of poor genotype fail to produce adequately even in environments where feeds are available, diseases are controlled and management is satisfactory. Pig survival from beginning of farrowing until weaning has genetic and environmental factor. Lower feed intake of sows at high ambient temperature has been related to reduced weight and higher death rate of piglets at weaning (Stansbury *et al.,* 1987; Prunier *et al*., 1997).

Breeding standards for pig endurance of individual pigs may, amongst others, be related to birth weight, process of farrowing, early postnatal pig behaviour, or the ability to stabilize body temperature after birth (Randall, 1977; Hoy *et al,* 1997; Le Dividich *et al*, 1998). Birth weight is regarded as one of the most significant factors affecting pig survival. Generally, farrowing survival and postnatal survival rise with increasing birth weight (Sharpe, 1966; Leenhouwers *et al*, 1999). Weightier piglets at birth have pointedly higher weaning weights. Piglets of higher birth weights consume more milk per suckle than their lighter littermates and this could be the main reason why heavier piglets outgain lighter ones (Dzama *et al*, 1999).These imply that survival of the piglets to adulthood are improved by probabilities of higher birth weights and weaning weights.

Rearing of pigs in rural areas is characterized by a scarcity of inputs in terms of manpower and feed. In the communal setting, the sow and piglets are not adequately cared for. In order to improve pig production under traditional systems, constraints and possibilities have to be identified and addressed. Many authors have indicated several constraints of pig production in small farms in tropical countries, among which are management and practical know-how to use the feeds on the farm and a lack of government support which affect production (Saadullah and Saad, 1998). A study conducted by Els (2000) in Namibia on the production potential of indigenous pigs indicated that there are no scientific data on reproduction rate and production traits. Hence, it is difficult to assist farmers to solve their problems. There is a lack of data regarding the levels of yield in smallholding pig farming system.

In order to have a broad idea of the farm yield, the farmer needs a record containing all data required for such an assessment. Generally, home-grown pig owners do not have records that let them measure animal production (Fickers, 1991). Consequently the pig owner usually does not have an idea if the production numbers are increasing or decreasing (Suarez and Barkin, 1990).

CHAPTER 3
MATERIALS AND METHODS

3.1 Study area

Research was undertaken in Sekhukhune district situated in the southern part of Limpopo Province. Borderline of the area is situated at approximately 110km from capital city of Polokwane. The area is dominated by Pedi and Ndebele speaking tribes. The substantial part of the district is subjected under various paramount chiefs. The area has a probability of rainfall of about 500mm to 700mm in summer. The area also has different climatic condition. This study was conducted throughout the Sekhukhune district in all 5 municipalities. Figure 3.1 show location of study area.

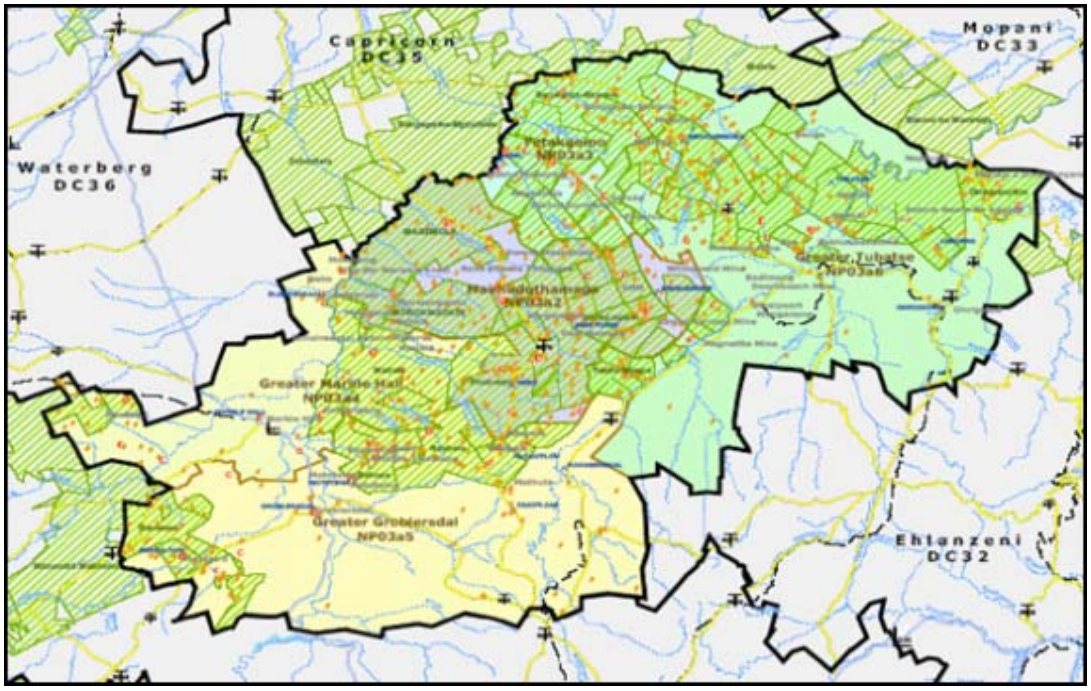


Figure 3.1. *Location of Sekhukhune District*

3.2 Research design and approach

A mixed research method was used for the study. This method enhanced the complementary between quantitative and qualitative methods (Seaman, 1987). The approach is suitable in research programmes due to the type of the research being conducted and it is possible to gather both quantitative and qualitative data. The data collection technique in the mixed methods approach is a combination of the tactics in the qualitative and quantitative research patterns.

3.3 Sample size and sample selection

Sekhukhune District was select as the study area because there are numerous farmers who were requesting professional advice on the pig breed that will improve their pig production enterprise. This triggered the study at this location. Target population in the study were farmers residing in Sekhukhune District, regardless of the quantity of pigs they kept. The target group is describe as a group of farmers whose conditions are comparable enough and they can all adopted and use the similar information and recommendations (Matata *et al*,2001) and as a result all pig farmers in Sekhukhune District were targeted. A total of 52 pig farmers were interviewed for the study.

3.4 Sample tools

The sampling frame model was developed from all government extension services for pig farmers around the district. A database of all pig farmers around the district was compiled into sample frame. The main research instrument used in the study was questionnaire. Collection of data from pig farmers was done means of questionnaire. A structured questionnaire was used because it had more closed question with answers defined in advance and therefore led the respondents (Mathers *et al*, 2009). A measuring tape, sliding ruler and callipers were also used. The tape measure was used to measure body length, chest girth, head length and ears length. The sliding ruler was used to measure wither height of the pig. The calliper was used to measure pelvic width as used by FAO (2012).

3.5 Sampling procedure

A stratified random sampling of pig farmers in each of the municipalities were grouped into emerging, subsistence and backyard as indicated by Kovacs, (1985). Due to few numbers of pig farmers in the study area, all pig farmers were interviewed. Two indigenous pig farmers and one exotic pig farmer was selected for the purposes of monitoring the growth of the piglets over a period of two months. Piglets were weighed fortnightly.

3.6 Data collection

This research study was based on primary data in accordance with what has been outlined by Montello and Sutton, (2006). Primary data was gathered utilizing a structured questionnaire. The structured questionnaire assisted in the collection of qualitative data of farmers such demography, production practices, herd structure, feeds and feeding, breeding practices and marketing and conservation methods.

3.7 Data analysis

Quantitative data was captured in MS Excel Package and analysed statistically utilizing the SAS Package (SAS, version 9.3) The Procedure FREQ of SAS was utilized to generate simple frequency tables for variables of interest .

CHAPTER 4
RESULTS

4.1 Introduction

The key aim of the study was to characterize pig genetic resources under the resource poor farming systems. The specific objectives were to determine the breeding practices of pig genetic resources under Sekhukhune District and to identify conservation methods and challenges to pig production under the resource poor farming systems using descriptive statistics. The study also investigated the major social-economic determinants of success under resource poor farming systems using descriptive statistics. A total of 52 pig farmers were surveyed in the present study. GPS co-ordinates for all 52 respondents where the interviews were conducted and recorded for future study purposes. The survey was carried out in the five municipalities of Sekhukhune District, namely, Elias Motsoaledi, Makhuduthamaga, Tubatse, Ephraim Mogale and Fetakgomo.

4.2 Demographics of pig farmers in Sekhukhune District

Information from table 4.1 depicts the demographic characteristics of the farmers in order to describe and quantify certain characteristics of the farmers such as gender of respondent, position of respondent, marital status of respondent and age of respondent. Most of the respondents were males (78.85%). A number of the respondent were owners (59.62%) and married (84.62%). A large proportion of respondents were household heads, age range between 55-64 years and 82.69% of respondents were North Sotho speaking.

Table 4.1 Demographics of pig farmers

Parameter		
Gender of respondent	Frequency	Percentage
Male	41	78.85
Female	11	21.15
Position of respondent		
Owner	31	59.62
Chairperson	7	13.46
Beneficiary	5	9.62
Worker	5	9.62
Relative	4	7.69
Marital status		
Married	44	84.62
Single	8	15.38
Age of respondent		
>65	6	11.54
55-64	26	50.00
45-54	9	17.31
35-44	6	11.54
25-34	2	3.85
<14	3	5.77
Ethnic group of respondent		
Sotho	43	82.69
Ndebele	6	11.54
Other	3	5.77

4.3 Educational level of pig farmers in Sekhukhune District

Educational level of respondents ranged from those are illiterate to those having post school qualifications. Most of the respondents had secondary school qualifications (38.46%). The qualifications of the respondents were significant, such as diploma (19.23%) and degree (3.85%). There were respondents who received no training (67.37%). The respondents received training in production (81.25%). Most of the respondents had more than 8 years of experience farming with pigs (46%).

Table 4.2 Educational level of pig farmers

Parameters		
Educational level of respondent	Frequency	Percentage
None	4	7.69
Std 1-Std 6	16	30.77
Std 7-Std 10	20	38.46
Diploma	10	19.23
Degree	2	3.85
Training respondent received		
Yes	17	32.69
No	35	67.31
Type of training respondent received		
Production	13	81.25
Marketing	1	6.25
Other	2	12.50
Period respondent involved in pig farming		
01-03	5	10.00
03-05	14	28.00
05-08	8	16.00
<08	23	46.00

4.4 Pig farm type in Sekhukhune District

Figure 4.1 presented the farm type practised by pig farmers in Sekhukhune District. The highest farm type was subsistence (65.38%), followed by back yard farming (26.92%) while emerging farmers had the least percentage (7.69%).

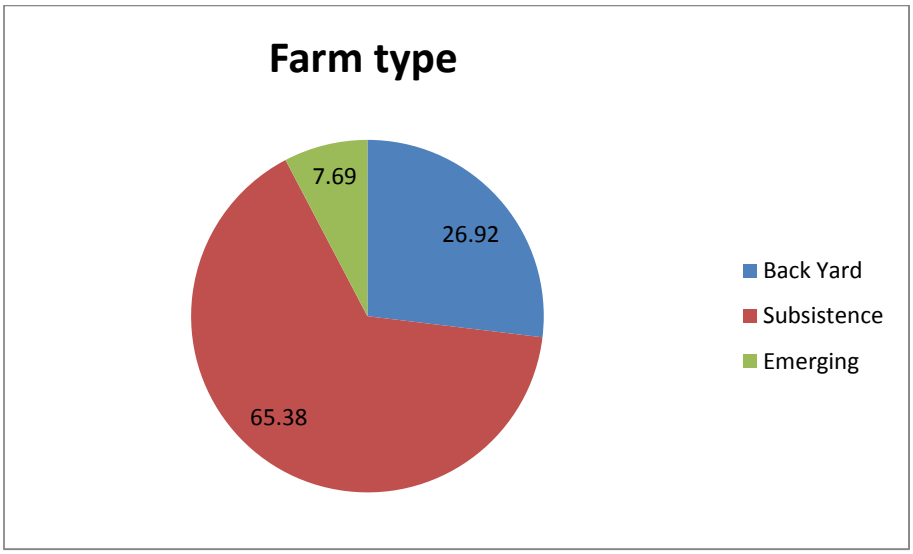


Figure 4.1 Farm type

4.5 Land ownership and business entity of pig farming in Sekhukhune District

Most of the farmers practiced informal farming (71.15%) as individual family members (Table 4.3). Farms owned by cooperatives were smaller than informal farming (19.23%). The Department of Agriculture strongly recommends that the farmers should form cooperatives. Pig businesses operating as companies constitute the lowest proportion of the respondents (9.62%). Land ownership of the farms is dominated by those on P.T.O (51.92%) issued by traditional heads, followed by those who own the land and few operated on leased land.

Table 4.3 Land ownership and business entity

Parameter			
Business entity of the farm		Frequency	Percentage
	Company	5	9.62
	Cooperative	10	19.23
	Informal	37	71.15
Land ownership of the project			
	Owner	17	32.69
	Lease	8	15.38
	P.T.O	27	51.92

4.6 Pig production practices in Sekhukhune District

Table 4.4 presented the pig production practices of the respondents. Farmers kept pigs for a variety of reasons such as meat, sale and others. The proportion of those raising pigs for sale was high for all the systems i.e. intensive (60.00%), semi-intensive (38.10%) and extensive (53.85%). Some respondent kept pigs for consumption under intensive, semi-intensive and extensive while those who kept pigs for other reasons were low. There were little differences between those who castrate and those who do not castrate their pigs. Respondents who castrated for breeding purposes were higher in intensive (64.29%), semi-intensive (78.57%) and extensive (71.43%) as compared to those who castrated for meat and others. The ages at which farmers castrate their piglets were high under intensive i.e. 4 weeks (42.85%), under semi-intensive at 3 weeks (33.33%) and extensive (34.48%) for 8 weeks.

Table 4.4 Pig production practices

		Intensive		Semi-Intensive		Extensive	
Parameter		Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Purpose of keeping pigs							
	Sale	18	60.00	8	38.10	28	53.85
	Meat	11	36.67	2	9.52	19	36.54
	Other	1	3.33	1	4.62	4	7.69
Castration							
	Yes	13	43.33	12	57.14	25	48.08
	No	17	56.67	9	42.86	27	51.92
Reasons for castration							
	Breeding	9	64.29	11	78.57	20	71.43
	Meat	3	21.43	2	14.29	5	17.86
	Other	1	7.14	1	7.14	2	7.14
Age of castration							
	3 weeks	3	21.43	5	33.33	8	27.59
	4 weeks	6	42.86	1	6.67	7	24.14
	8 weeks	5	35.71	5	33.33	10	34.48
	12 weeks			1	6.67	1	3.45
	Others			3	20.00	3	10.34

4.7 Pig health practices in Sekhukhune District

Table 4.5 present the animal health practiced by the respondents. In respect to the control of external parasite, the respondents in all the systems showed high levels of adoption (71.43%). The most preferred method of controlling external parasites was by spraying for intensive, semi-intensive and extensive systems (73.33%). The response of respondents to the control of internal parasites showed little or no differences between those who applied and those who did not apply. The most preferred method used to control internal parasites in all the systems was by injection (70.59%, 66.67% and 66.67% respectively). The accessibility of the institutional support providing services to farmers was found to be minimal. Most of the respondents did not vaccinate their pigs (80.00%) in all the production systems. A large proportion of respondents did not receive advice nor has access to veterinary services.

Table 4.5 Technical practices

	Intensive		Semi-Intensive		Extensive	
Parameter	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Control of external parasites						
Yes	22	73.33	15	71.43	38	73.08
No	8	26.67	6	28.57	14	26.92
Control method of external pest						
Spray	22	91.67	11	73.33	34	85.00
Pour-on	1	4.17	1	6.67	2	5.00
Traditional			1	6.67	1	2.50
Other	1	4.17	1	6.67	1	2.50
Control internal parasites						
Yes	16	53.33	10	47.62	27	51.92
No	14	46.67	11	52.38	25	48.08
Control method of internal parasites						
Trench			2	22.22	3	11.11
Injection	12	70.59	6	66.67	18	66.67
Other	5	29.41	1	11.11	6	22.22
Vaccination						
Yes	6	20.00	3	14.29	9	17.31
No	24	80.00	18	85.71	43	82.69
Access to Veterinary						
State Vet	2	6.67	3	15.00	5	9.80
Private Vet	5	16.67	4	20.00	9	17.65
Drug Supplier	1	3.33	2	10.00	3	5.88
Extension	1	3.33	2	10.00	3	5.88
None	18	60.00	6	30.00	24	47.06
Other	3	10.00	3	15.00	6	11.76

4.8 Pig production level in Sekhukhune district

Table 4.6 present the pig production system of the respondents. There was no major variation in the number of young pigs kept in all the systems. Similar results were observed for the boars and the sow. However, there was significant difference between weaners kept on intensive with the mean of (24.54) as compared to semi intensive (15.75) and extensive (21.19). Number of piglets born showed significant difference in extensive system with the mean of (61.94). Number of males bought had no significant difference on production level. The present result showed significant difference in the number of piglets that died in extensive and semi intensive as compared to intensive system. More males were sold in intensive system with a mean of (79.31) as compared to other production systems.

Table 4.6 Pig Production level

Variable	Intensive			Semi Intensive			Extensive		
	Number	Mean	Std Dev	Number	Mean	Std Dev	Number	Mean	Std Dev
Piglets	13	10.46	15.09	8	14.63	9.38	21	12.05	13.11
Boar	26	1.35	0.75	15	1.80	1.82	42	1.50	1.23
Sow	30	5.16	8.85	20	4.304	4.78	51	4.80	7.37
Weaners	26	24.54	27.95	16	15.75	15.68	42	21.19	24.19
Piglets born	29	24.54	27.95	20	49.70	37.87	50	61.94	91.22
Weaners bought	1						1	5.00	
Male bought	5	5.00	0.89	5	1.20	0.44	10	1.30	0.67
Female bought	2	1.40		3	6.00	7.81	5	4.00	6.16
Male lent	3	1.00		2	1.00		5	1.00	
Female lent		1.00							
Male donated	2			1	2.00		3	1.33	0.57
Female donated	1	1.00		1			2	0.50	0.71
Piglets died	26	1.00	10.38	19	10.63	11.17	46	11.72	10.64
Weaners died		12.88		1	3.00		1	3.00	
Weaners sold	16		133.84	10	44.20	90.58	26	65.81	118.35
Male sold	11	79.31	4.02	7	9.14	10.60	18	6.61	7.32
Female sold	10	5.00	5.07	7	5.28	2.29	17	5.59	118.35
Weaners donated		5.80		1	50.00		1	5.59	4.06
Male exchange				3	1.00		3	50.00	
Stolen Weaners	6		3.52	4	11.75	6.65	10	7.10	6.14
Slaughtered weaners	3	4.00	1.15	3	5.00	3.00	6	4.17	2.23
Slaughtered male	11	3.33	5.52	13	3.62	4.66	25	3.32	3.69
Slaughtered female	3	3.00	1.00	4	3.00	2.16	7	2.57	1.72

4.9 Herd structure and feeding practices in Sekhukhune District

Table 4.7 present the type of housing provided for the pigs in the study areas. Housing consisted of pigsties in intensive (83.33%), semi-intensive (85.71%) and extensive (84.31%) system. Few respondents provided proper housing to their pigs. Most of the farmers did not receive financial assistance (90.00%). A number of pig projects relied on their own boreholes and municipal pipes as source of water. Most of piglets were not provided with heating facility during the cold periods. The heating system that was used was infrared (66.67%) for intensive and (50.00%) for extensive. Pigs were fed with complete ration (16.67%) and kitchen waste (6.67%) in intensive system while others fed other feeds in semi intensive and extensive systems.

Table 4.7 Herd Structure and feeding practices

	Intensive		Semi-Intensive		Extensive	
Parameter	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Type of housing						
Sty	25	83.33	18	85.71	43	84.31
Yard	1	3.33	2	9.52	3	5.88
Proper house	4	13.33			4	7.84
Other			1	4.76	1	1.96
Financial assistance						
Yes	3	10.00	2	10.00	5	9.80
No	27	90.00	18	90.00	46	90.20
Source of water						
Dam	1	3.33			1	1.96
River	3	10.00	3	15.00	6	11.76
Borehole	12	40.00	3	15.00	15	29.41
Spring	2	6.67	2	10.00	4	7.84
Municipal pipes	12	40.00	12	60.00	25	49.02
Heat source						
Yes	3	33.33	1	11.11	4	22.22
No	6	66.67	8	88.89	14	77.78
Type of heater						
Infrared	6	66.67			2	50.00
Other	1	33.33	1	100.00	2	50.00
Type of feed						
Complete ration	5	16.67	1	4.76	6	11.54
Home ration			1	4.76	1	1.92
Crushed grain			1	4.76	1	1.92
Kitchen waste	2	6.67	5	23.81	7	13.46

4.10 Pig breeding practices in Sekhukhune District

Reproduction management practices differed among the production systems (Table 4.8). Breeding trends for all production systems were stable in intensive (70.00%), semi-intensive (65.00%) and extensive (66.67%). Farmers obtained their breeding stock from various places but the majority were those who obtained them from communal areas while others obtain their breeding stock from commercial breeders. Individual mating was commonly practiced in all production system (71%). Cross breeding was the breeding method practised by most farmers. These farmers obtained their breeding boars from different areas.

Table 4.8 Breeding practices in Sekhukhune District

	Intensive		Semi-Intensive		Extensive	
Parameter	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Trent of breed						
Increase	7	23.33	5	25.00	13	25.49
Decrease		6.69	2	10.00	4	7.84
Stable	21	70.00	13	65.00	34	66.67
Where breed obtain						
Commercial	6	20.00	2	9.52	8	15.38
Communal	29	76.67	16	76.19	39	75.00
Inherited	1	3.33			1	1.92
Market			1	4.76	1	1.92
Other			2	9.52	3	5.77
Breeding method						
Cross breed	20	66.67	11	57.89	32	64.00
Line breed	2	6.67	1	5.26	3	6.00
Inbreeding	7	23.33	5	26.32	12	24.00
Other			1	5.26	1	2.00
Where boar comes						
Borrowed	2	6.67	2	10.00	4	7.84
Bought	20	66.67	10	50.00	31	60.78
Owed bred	7	23.33	7	35.00	14	27.45
Donated	1	3.33	1	5.00	3	3.92

4.11 Mating practices in Sekhukhune District

Table 4.11 present the type of mating practiced by the pig owners in the research area. Most of the farmers kept a single boar for mating and practice individual mating in all production system (71%). Farmers practised continuous mating (90%). A significant proportion of the respondents weaned their piglets at the age of 5 weeks. Most of the respondents waited for 21 days after weaning before the next mating.

Table 4.9 Mating practices in Sekhukhune District

	Intensive		Semi-Intensive		Extensive	
Parameter	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Mating method						
Uncontrolled	3	10.00	5	23.81	9	17.31
Insemination			1	4.76	1	1.92
Individual	27	90.00	15	71.43	42	80.77
Number of boar used						
01	24	82.76	14	73.68	39	79.59
02	2	6.90	3	15.79	5	10.20
03	2	6.90	1	5.26	3	6.12
<04	1	3.45	1	5.26	2	4.08
Mating season						
Summer	1	3.33	2	9.52	3	5.77
Winter	1	3.33			1	1.92
Annually	28	93.33	19	90.48	48	92.31
Age of weaning						
3 weeks			1	4.76	1	1.92
4 weeks	8	26.67	4	19.05	12	23.08
5 weeks	14	46.67	6	23.81	19	36.54
6 weeks	4	13.33	6	28.57	10	19.23
No weaning	4	13.33	5	23.81	10	19.23
Weaning to weaning						
5 days	7	26.92	4	25.00	11	26.19
21 days	15	57.67	4	25.00	19	45.24
Not known	4	15.38	8	50.00	12	28.57

4.12 Marketing practices

As shown in Table 4.10, farmers sell a large proportion of their pigs (76%). The market place varies according to production practises. Farmers in intensive system sold to private buyers (42.31%), semi-intensive used other (55.56%) while extensive system also sold to private buyers (47.73%). The weight which the respondents preferred to market their pigs across the production system was 50-60 kg (50%). Most of the respondents drove more than 100km (55%) to the market and used their own transport. Pigs are sold at an average price of R500-1000 and above (77%).

Table 4.10 Marketing practices in Sekhukhune District

	Intensive		Semi-Intensive		Extensive	
Parameter	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Selling of pigs						
Yes	26	92.86	16	76.19	42	85.71
No	2	7.14	5	23.81	7	14.29
Market place						
Auction	8	30.77	1	5.56	9	20.45
Abattoir	3	11.54			3	6.82
Privately	11	42.31			21	47.73
Other	4	15.38	10	55.56		
Weight for market						
30-40	6	23.08	3	20.00	9	21.95
40-50	5	50.00	9	60.00	22	53.66
50-60	15	19.23	2	13.33	7	17.07
60-70	2	7.69	1	6.67	2	4.88
Market distance						
>30			1	11.11	1	4.17
30-50			2	22.22	2	8.33
50-70	1	6.67			1	4.17
70-100	4	26.67	1	11.11	5	20.83
<100	10	66.67	5	55.56	15	62.50
Mode of transport						
Own	11	73.33	7	87.50	18	78.26
Hired	4	26.67	1	12.50	5	21.74
Average price						
R500-1000	21	77.78	18	100.00	39	86.67
R1000-3000	6	22.22			6	13.33

4.13 Conservation practices in Sekhukhune District

Table 4.11 presents the conservation practices of the respondents. From the result, respondents had minimal pig conservation awareness. The conservation awareness of all the respondents were in all production systems was above (76%). The respondents valued indigenous breeds moderately in intensive (63.33%), while semi-intensive (47.62%) and extensive systems were 47.62% and 57.69% respectively. The respondents used exotic breed for the purpose of market and size. Most of the respondents were aware of the extinction of indigenous pig breeds.

Table 4.11 Conservation practices

	Intensive		Semi-Intensive		Extensive	
Parameter	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Conservation awareness						
No knowledge	7	23.33	8	38.10	15	28.85
Minimal	17	56.67	10	47.62	28	53.85
Average	4	13.33	2	9.52	6	11.54
Well informed	2	6.67	1	4.76	3	5.77
Value of conservation						
Extreme	2	6.67	2	9.52	4	7.69
Important	25	83.33	16	76.19	42	80.77
Not important	3	10.00	3	14.29	6	11.54
Value of indigenous						
Extreme	3	10.00	7	19.05	7	13.46
Moderate	19	63.33	10	47.62	30	57.69
Not valuable	8	26.67	7	33.33	15	28.85
Reason use of exotic						
Market	8	28.57	2	12.50	10	22.22
Conformation					2	4.44
Growth			1	6.25	10	22.22
Size	8	28.57	2	12.50		
Awareness of extinction						
Yes	16	93.33	20	95.24	49	94.23
No	2	6.67	1	4.76	3	5.77

4.14 Phenotypic description of pigs

Table 4.12 present the phenotypic description of pigs tin the study area. The results in the study area showed that landrace and large white had a dominant white colour (86%). Windsnyer pigs showed a dominant black colour (75%) and Duroc showed brown colour (66.67%). Most of pig breeds had medium size snout (75%) like Duroc, Koelbroek, Landrace and Large white. Windsnyer had varied snout size. Profile face of most pig breeds was dominated by concave shape. Duroc breeds had convex (100%) and windsnyer was dominated by flat face (60%). Profile back of most pigs showed straight pattern. Duroc and landrace pig breeds had large ear size compared to Koelbroek that showed rudimentary size (100%) and medium size of large white and windsnyer. The present result showed variety of ear orientation. Duroc had lateral ear (100%), Koelbroek had erect ear (100%), and Landrace had the highest number of drooping ear (64.86%). Large white and Windsnyer showed variation of ear orientation.

Table 4.12 Phenotypic description of pigs in Sekhukhune District

	Duroc		Koelbroek		Landrace		Large white		Windsnyer	
Parameter	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%
Coat pattern										
Colour1	2	66.67			32	88.89	103	95.37	2	85.71
Colour 2	1	33.33	1	25.00	4	11.11	5	4.63	4	14.29
Spotted			3	75.00						
Coat colour										
White					31	86.11	99	91.67	1	3.57
Black					1	2.78	1	0.93	21	75.00
Brown	2	66.67								
Fawn					1	2.78	3	2.78	2	7.14
Head snout										
Short			1	25.00	1	2.70	10	9.26	7	25.00
Medium	3	100.00	3	75.00	36	97.30	97	89.81	19	67.86
Long							1	0.93	2	7.14
Profile face										
Flat			1	25.00	10	27.03	38	35.51	17	60.71
Concave			3	75.00	27	72.97	69	64.49	1	39.29
Convex	3	100.00								
Profile back										
Hallow			1	25.00	3	8.11	14	12.96	6	21.43
Straight	3	100.00	3	75.00	34	91.89	94	87.04	22	78.57
Ear size										
Rudimentary			4	100.00						
Medium					15	40.54	102	94.44	28	100.00
Large	3	100.00			22	59.46	6	5.56		
Ear orientation										
Erect			4	100.00			46	42.59	8	28.57
Lateral	3	100.00			13	35.14	50	46.30	18	64.29
Drooping					24	64.86	12	11.11	2	7.14

4.15 Phenotypic orientation of pigs

Table 4.13 present the phenotypic orientation of the pigs. The result showed that chest girth had high significant effect on body weight estimation of animal. The Duroc mean chest girth was 130.67 which had high significant effect on body size across all pig breeds. Windsnyer had mean of 92.59. The Windsnyer mean wither size was 26.88. The mean body length of Duroc (94.00), landrace (93.00) and large white (90.49) showed no differences. The ear length and tail length has no significant effect on variation breeds. The Windsnyer had mean head length of 24.62 compared to other breeds.

Table 4.13 Phenotypic orientation of pigs in Sekhukhune District

	Duroc		Koelbroek		Landrace		Large white		Windsnyer	
Variable	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
Chest girth	130.67	29.01	105.00	34.19	121.60	23.54	111.97	22.15	92.59	32.63
Wither	41.67	1.52	41.00	12.70	40.19	6.69	37.39	6.48	26.88	8.25
Body length	94.00	15.09	59.25	6.99	93.00	15.41	90.49	21.24	61.85	18.00
Pelvic width	35.33	3.21	24.75	8.54	28.62	7.09	27.14	6.14	21.63	7.59
Ear length	18.33	2.89	16.50	3.00	22.36	4.26	18.62	4.13	13.86	3.54
Tail length	1.67	1.15	2.00		1.38	0.55	1.65	0.66	1.96	0.43
Tail size	14.33	14.01	25.75	6.45	11.91	10.55	17.10	11.31	17.04	8.59
Teat number	13.33	1.15	11.50	1.00	13.94	1.31	13.28	1.58	12.07	1.15
Head length	31.33	1.15	26.50	2.38	30.59	2.69	29.99	3.38	24.62	3.65

4.16 Piglets growth of difference breeds

According to Table 4.14, there were no significant difference of breeds growth for week one. However, the result showed significant difference from week two with mean of 2.24.

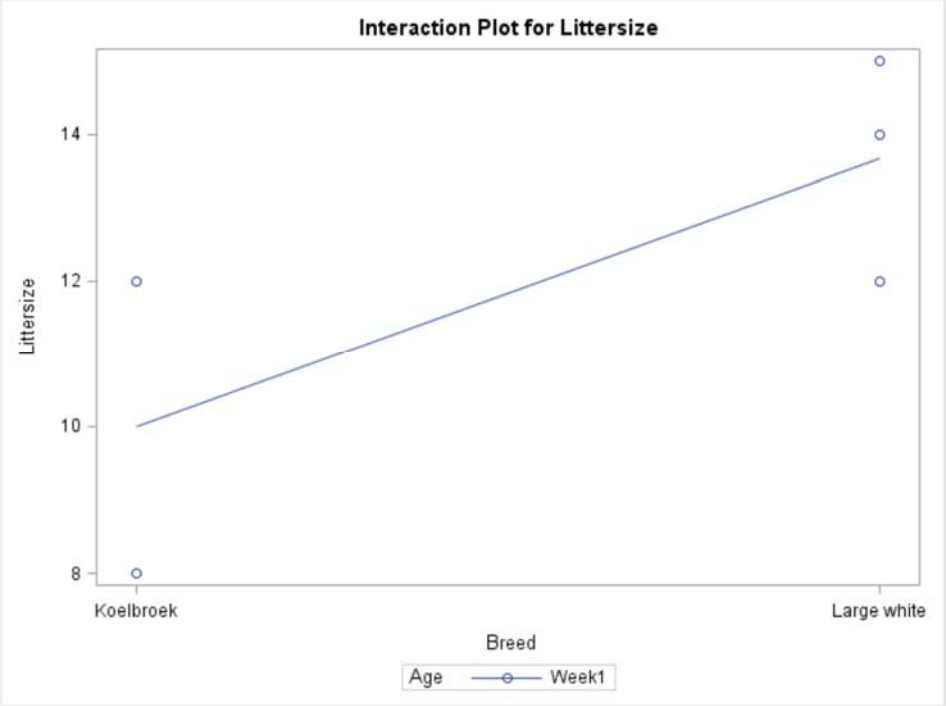
Table 4.14 Piglets growth of difference breeds

Variables	Age	N	Mean	Std Dev
Koelbroek	Week1	3	1.04	0.08
Koelbroek	Week2	18	1.08	0.13
Koelbroek	Week3	10	2.12	0.20
Koelbroek	Week4	17	2.72	0.22
Koelbroek	Week6	10	3.88	0.46
Koelbroek	Week8	10	4.27	0.67
Large white	Week1	2	1.25	0.07
Large white	Week2	41	2.24	0.48
Large white	Week3	38	3.17	0.59
Large white	Week4	36	4.38	0.88
Large white	Week6	36	5.28	1.45
Large white	Week8	13	5.27	1.76

4.17. Litter size of the breeds

With respect to Figure 4.2, the litter sizes increases across the breeds. The result showed that Large white breed had higher number of litter size as compared to koelbroek.

Figure 4.2 Litter size of the breeds



CHAPTER 5

DISCUSSIONS

5.1 Profile of the study area

Almost 70% of Sekhukhune District is dominated by rural areas which develop into semi urban. Makhuduthamaga and Fetakgomo local municipalities have no established towns except communal areas. The number of people still reside in communal areas where traditional leadership rule. It was observed from this study that most of the areas meant for farming developed into residential area. In some instances entire villages have been transformed into semi-urban area. This transformation has impaired the free range system. There were approximately an overall of 33 chiefs around the research area. The farming systems prevailing in the rural areas are apparently characterised by the socio-economic and socio-cultural dynamics within the communities. This finding of this present study has detected certain fundamental issues that should be considered for intervention in protecting pig breeds. Traditional pig farming has its benefits that do not link to the mainstream of the economy. There are various values that are traditionally attached to indigenous pig products which cannot be scientifically proven. The fact that indigenous pigs are characterized by low maintenance makes them suitable to be bred in rural areas and considered as an opportunity to alleviate poverty. Free range has become an impossible production practice due to areas developing into semi urban communities.

5.2 Demographics of pig farmers in Sekhukhune District

Pig farmers in the study areas are characterized by inadequate resources, both financially and materially. Most of the respondents were largely males (78%) compared to female, as observed by Weethima Visalvethaya *et al*. (2010). The high number of males owning pigs in Sekhukhune District contradicts other studies where females were pig owners. Gcumisa ***et al.*** (2013) and Madzimure *et al*. (2013) in a research done in the Eastern Cape Province in RSA discovered that females owned and look after the pigs. Pig producers find it difficult to develop due to lack of funding assistance. From the research, the age group category for household heads was in the range of 55-64 years old (50%). Aging citizens were participate in agriculture, while youth of less than 30 years old did not want to get engaged according to de Villiers (2005). The 62.5% of the respondents in Botswana who reared pigs were over 41 years old by Nsoso *et al*. (2006).

In Tanzania those who reared pigs had an average age of 38 years (range 18 -70 years) found by Kamuribo *et al*. (2011). Most of pig projects were headed by pensioners. Respondents in three municipalities were dominated by Sotho speaking followed by Ndebele.

5.3 Educational level of pig farmers in Sekhukhune District

The educational level of respondents extended from those with no education to those having tertiary qualifications within the District. There were number of respondents who received no training (67%), which led them to practice pig farming without basics skill. According to de Villiers (2005) training is an integral basis of improvement as those who were willing to be trained become better farmers and more prosperous than those that had no training at all. Type of training received by few respondents where production, financial and marketing. Most of the respondents had more than 8 years of know-how in farming with (46%). This is in agreement with Ogunkoya (2014) who reported that respondents had amongst 7 and 12 years of experience in Free State in RSA (47.2%).

5.4 Pig farm type in Sekhukhune District

High percentage of subsistence farming (65.38%) was practiced by the pig farmers. These results is in agreement with Moorosi (1999) who reported that livestock provide income for South African small-scale farmers and animals are sold when there was a need for cash. Subsistence farming provides about 90-98 % of the livestock and crop production. (Shiferaw and Holden, 1999). From the present study, significant proportions of farmers engaged in subsistence farming.

5.5 Land ownership and business entity of pig farming in Sekhukhune District

Most of the pig farmers (71.15%) practiced informal farming as individual family members as compared to those owned by cooperatives and companies. According to Ogunkoya (2014), only (12 %) of the farms were owned by single farmers, while most were owned in groups or by a trust. This implies that farmers did not have full control over their farms and registered their project as business entity. Land ownership of the farms is dominated by those on P.T.O (51.92%) issued by traditional leaders as compared to those who own and lease the land. Land ownership in Northern Kwa-Zulu Natal was reported by the livestock extension official to be under traditional control (Kunene *et al.,* 2006). The P.T.O and the leasing of land are not very conducive for development as they restrict the farmers, they are unable to get funding from various institutions. If the farmer owns the land they can use that land as collateral when applying for credit.

5.6 Pig production practices in Sekhukhune District

Farmers kept pigs for various reasons such as sale, meat and others. The proportion of those raising pigs for sale was high on all production systems. Some respondents also kept pigs for consumption. These results are in cohort with the report by Chimonyo *at al*. (2005) and Madzimure *et al.* (2013). Kagira *et al*. (2010) discovered that 98% of farmers reared pigs for earnings and the rest for consumption. This agrees with a report by Losada *et al.* (1997) that pig rearing has been oriented towards the production of meat. The number of respondents who castrate pigs and those who do not castrate are almost similar. The respondents who castrated pigs for breeding were high in all production systems. The number of farmers who castrate pigs for meat quality is low. A large number of farmers under intensive systems preferred to castrate their piglets at 4 weeks of age. Number of respondents under semi-intensive and extensive considered 3 and 8 weeks of age to castrate piglets. In Thailand farmers castrated most male piglets in litters as a technique of regulating breeding in semi intensive systems by Nakai (2012).

5.7 Pig health practices in Sekhukhune District

Most of the respondents were willing to control external parasites. The respondents sprayed their animals to control parasites in all production system. The proportion of farmers who controlled internal parasites was almost similar to those who do not control the parasites. The injection was a preferred method used to control internal parasites. There was minimal accessibility to the institutional support providing services to the farmers. There was marginal support received from extension and veterinary services. Haug (1999) also found that extension services did not address the most serious problems faced by farmers. Poor veterinary services are the corner-stone of production constraints in pig farming observed by Vithanage *et al*. (2014). The finding by Ogunkoya (2014) showed that farmers encountered problems in gaining access to veterinary services. Many farmers do not vaccinate their pigs. Failure to take care of the health of animals has a detrimental effect on performance and subsequently productivity of the animals.

5.8 Pig production level in Sekhukhune District

The number of piglets kept by farmers was satisfactory in all production systems. Small scale pig farmers in the rural areas are grouped with regard to their roles in rural pig production systems such as those who produce piglets and raise them to market weight, those who buy weaned piglets and feed them to market weight and those who keep the service boars for hire. Saadullah and Saad (1998).

Large-scale pig farms extent to 15 to 20 percent of the total regional pig population (Northoff 2006). Number of boars kept by respondents in intensive, semi intensive and extensive systems showed no significant difference. The weaners and sows kept by farmers from all production levels were reasonable. Most of the respondents do not acquire stock from other breeders. The result showed that a high number of piglets died in extensive and semi intensive systems as compared to intensive production system. There were number of male sold on intensive compared to other production systems.

5.9 Herd structure and feeding practices in Sekhukhune District

Most of the farmers from all production systems used sties to shelter their pigs. Pigs housed in poor condition might be more vulnerable to stress which may affect the value of pork as suggested by Warriss *et al*. (1983) and Beattie *et al*. (2000). Many farmers did not receive financial assistance. A number of pig projects relied on municipal pipes and boreholes as source of water. Haynes (2001) reported that the pigs were kept and provided water from various sources and at different times. Most of the piglets were not provided with source of heat. The heating system found to be dominating were infrared. Pigs are fed with complete ration and kitchen waste on intensive system. In other production systems, farmers fed pigs with various feedstuffs while indigenous pigs are mostly fed kitchen wastes. Some of the farmers do not provide pigs with feed supplements. Conejo and Mejorada, (1990); Losada *et al*. (1995); Castillo, (1988); reported that indigenous pigs are usually fed on kitchen residuals, maize, wheat by-products, and alfalfa and regularly scavenge on available grazing land. According to Deka *et al*. (2007) Poor feeds that has insufficient protein was a main contributor of a prolong time pigs took to attained slaughter weight. (Kanengoni *et al*. 2002) reported that indigenous pigs have superior abilities to use fibrous feeds as compared to exotic genotypes such as the Large White breed.

5.10 Pig breeding practices in Sekhukhune District

The trends of breeds on all production systems were stable. Farmers obtained their breeding stock from various areas but most highly were those who acquired from the villages, while others obtained their breeding stock from commercial breeders. Madzimure *et al*. (2013) found that 66% of farmers acquired boars from fellow adjacent farmers. According to Gcumisa *et al*. (2013), some respondents choose the breeds they utilized and buy without any motive and preferential selection of specific breeds. Individual mating was most commonly practiced on intensive, semi-intensive and extensive systems. From the present study, few respondents practiced uncontrolled mating. Cross breed were the most breeding method practised. According to Chimonyo *et al.* (2005) crossbreeding systems should be deliberated and well performed so that pure genes of the home-grown pigs are retained for future practices. In this study, farmers obtained their breeding boar from various places but most remarkable were those who bought, followed by those who bred their own. Most the farmers kept a single boar for mating.

5.11 Mating practices in Sekhukhune District

The findings in the present study showed that most farmers practised continuous mating. Respondents used 5 weeks of age for weaning period. Most of the respondents applied 21 days after weaning before the next mating. In Ramotswa village of Botswana farmers weaned piglets at age of 4 months as reported by Nsoso *et al*. (2006) and in Zimbabwe Chiduwa *et al*. (2008) reported that farmers weaned piglets approximately 6 to 8 months of age. Weaning age for young pigs has changed radically over the years since the 1950s, from about 8 weeks to the current age of 22 to 26 days in several pig producing countries according to Williams (2003).

5. 12 Marketing practices in Sekhukhune District

The market place varies according to production practises. In intensive production system, farmers sell to private buyers, semi-intensive used others and extensive producers sold to private enterprise. Huge amount of pigs traded within the local market as witnessed by Nsoso *et al*. (2006) in Ramotswa village (Botswana) and Busia District (Kenya). Kagira *et al*. (2010) discovered that 95% of farmers bought pigs within their vicinity which mean that pigs were sold locally by most rural farmers.

Madzimure *et al*. (2013) in a study in Eastern Cape Province also reported a huge amounts of pig farmers trading within their communities. Some farmers traded pigs to abattoirs, butcheries and superstores by Madzimure *et al*. (2013). The weight which the respondents preferred to market their pigs in both production systems were 50 - 60 kg. Most of the respondents drove more than 100 km to the market and used their own transport with the average price ranges from R500 - R1000.

5.13 Conservation practises in Sekhukhune District

Most respondents had minimal pig conservation awareness and value conservation. The respondents valued indigenous breeds moderately in intensive, semi-intensive and extensive systems. The respondents used exotic breed preferably for market and size. The prerogative by national governments on amassing productivity has led to the domination of exotic breeds in Southern Africa (Chimonyo *et al.,* 2005). Most of the respondents were aware of the extinction of indigenous pig breeds. There was no conservation method practiced to prevent extinction of indigenous pig breeds. The promotion of foreign breeds in the underprivileged communities has been proposed as one of the reasons why underprivileged farmers stay poor (Wilson, 1995).

5.14 Phenotypic description of pigs

Certain breeds had common coat pattern. The results in the study areas showed that white were dominant colour in landrace and large white. Foreign breeds such as Large White and Landrace have increased reputation in the rural areas and amongst the subsistence farmers. Halimani *et al*. (2012) reported that a number of reasons have led to home-grown pigs being considered. Windsnyer pigs showed a dominant black colour and Duroc showed brown colour. Most of the pig breeds had medium size snout like Duroc, Koelbroek, Landrace and Large white. There was variety of snout size on Windsnyer. Profile face of most pig breeds were dominated by concave shape. Duroc breeds had convex and Windsnyer was dominated by flat face. Profile back of most pigs in the present study showed straight pattern. Duroc and Landrace pig breeds had large ear size compared to Koelbroek that showed rudimentary size and medium size of Large white and Windsnyer. Results showed variety of ear orientation. For example, Duroc had lateral ear, Koelbroek had erect ear, and landrace had drooping ear. Large white and Windsnyer showed variation in ear orientation.

5.15 Phenotypic orientation of pigs

The present study showed that chest girth had high significant effect on estimating body weight of animal. The Duroc has bigger body size compared to all pig breeds. The body length of Duroc, Landrace and Large white has no big difference. The ear length and tail length has no significant variation on all pig breeds. The Windsnyer had a smallest head length compared to other breeds. Lemke *et al*. (2007) noted that the use of exotic breeds was a disadvantage for resources-poor farmers as these breeds were highly producing but also have financial risk due to high input requirements Lemke *et al*. (2007).

5.16 Piglets growth of difference breeds

This study revealed that large white grows much better than koelbroek. The type of breed has effect in influencing the weight of an animal. Indigenous pigs have small body size as compared to exotic breeds. White piglets are the offspring of such crossing and weigh more than the black piglets of the indigenous breed (Munyai, 2008). The slow growing home-grown pigs can be utilized where farmers do not have the objective of achieving rapid growth rates, such as in some rural areas, where pigs are mostly kept to provide pork for household consumption (Chimonyo *et al*, 2001; Kanengoni *et al*, 2002).

5.17 Litter size of the breeds

The study showed that large white produced more number of piglets per litter as compared to Koelbroek breed. Breed type was found to have effect on the litter size. Indigenous pigs due to their small size produce small litter as compared to exotic breeds. According to Gcumisa, (2013), a relation exists between indigenous pigs and their lesser litter size as well as exotic breeds and their large litter size. In Botswana with Tswana pigs the most common litter size was 5 to 8 piglets per sow by Nsoso *et al*. (2006). Variety of litter sizes observed in the research area concur with what various authors have reported regarding the foreign breeds which have greater productivity but also higher inputs requirements (Chimonyo *et al*. 2005; Lemke *et al*. 2007).

Plate 5.1: Wounded sow being treated against maggot infestation
Source: Phogole (2015)

Plate 5.2: Severely sick pig kept without any treatment in the pen
Source: Phogole (2015)

Plate 5.3: An exotic breed kept in the yard with makeshift structure
Source: Phogole (2015)

Plate 5.4: Pregnant sows kept in corrugated protected yard
Source: Phogole (2015)

Plate 5.5: Pregnant sow kept in the farrowing pen
Source: Phogole (2015)

Plate 5.6: Indigenous sow kept under rock made pen
Source: Phogole (2015)

Plate 5.7: Weaners in poor condition kept without water
Source: Phogole (2015)

Plate 5.8: Swill fed to pigs in a cut tyre
Source: Phogole (2015)

Plate 5.9: Mellon used to feed pigs
Source: Phogole (2015)

Plate 5.10: Mixture of kitchen waste and vegetable residues in a drum exposed to sun
Source: Phogole (2015)

Plate 5.11: Soaked bread in a plastic container
Source: Phogole (2015)

Plate 5.12: Uncontrolled mating and unselected pigs kept in a yard
Source: Phogole (2015)

Plate 5.13: Individual mating of crossbreed between Duroc and Large white
Source: Phogole (2015)

Plate 5.14: Cross breed gilt
Source: Phogole (2015)

Plate 5.15: Cross breed gilts between Warthog, Large white and indigenous breed
Source: Phogole (2015)

Plate 5.16: Boar cross breed between Warthog and large white
Source: Phogole (2015)

Plate 5.17: Sows with gilts kept under makeshift structure
Source: Phogole (2015)

Plate 5.18: Windsnyer breed
Source: Phogole (2015)

Plate 5.19: koelbroek breed feeding young piglets
Source: Phogole (2015)

CHAPTER 6

CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

Practices of pig production discovered in the rural areas of Sekhukhune District were in most cases comparable to those witnessed in other provinces. The number of males farmers involved in pig farming was higher than that of women. Plenty of the farmers had know-how in pig farming because they reared pigs for a long period but did not upswing their production expertise. Limited number of farmers has been skilled in pig production. Therefore, skilled farmers did better than unskilled farmers. Welfare and management of pigs showed a slight improvement in Sekhukhune District. Selection criteria for breeding stock were not practiced by farmers. Exotic breeds are maintained under a traditional rearing system. There was no proper management system of breeding and weaning pigs. Pigs were raised for two purposes, to provide meat for household consumption and for market.

Piglet's mortality was mainly due to exposure to cold which pose serious threat to production. Veterinary services were not accessible by most farmers. Due to lack of financial support housing, feeding, and general management was poor to the majority of farmers. Farmers utilized various marketplaces with prices being suggested at the point of sale.

6.2 Recommendation

Limpopo Department of Agriculture should establish Local and District Animal Genetic and Conservation forums of which the indigenous pig production will also benefit. These could be enhanced by funding through government instruments such as CASP, Fetla Tlala, and related instruments. It was also recommended that a government led breeding program with small holder farmers be developed to preserve the indigenous genetic pool. This will prevent the reduction in the numbers of indigenous pigs due to cross-breeding. There is a great need for a mentoring program within local and district areas between small holder farmers and commercial farmers. Pig production has the potential of supporting many poor households in the rural areas. Such a mentorship program will reduce the gap in the rural area with regard to the marketing of livestock and related products.

It is therefore recommended that adequate support, such as the institutional support be given to indigenous pig producers. Government extension and advisory services should be linked to the resource-poor farmers in rural areas and be effective in assisting with technical support. It is a prerogative of the government to encourage rural people to initiate food security projects, where the Department of Agriculture provides inputs for the rural poor farmers. It is important to provide necessary support as indigenous pig producers are not able to secure a veterinary service that will assist them in treating animals or to inform them about vaccination.

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CONSENT FORM

TITLE OF RESEARCH PROJECT

Characterization and Conservation of Indigenous Pig Genetic Resources in Sekhukhune District of Limpopo Province

Dear/Mr/Mrs/Miss/Ms _____Date..…/..…/2015

NATURE AND PURPOSE OF THE STUDY

The purpose of this research project is to explore description of pig breeds and conservation strategies of indigenous pig breeds. Pig farming should be able to increase the prosperity of the rural communities. The study of this nature is therefore important in order to contribute towards promote knowledge and understanding of the existing breeding practices to indigenous pigs with exotic pigs that influence farming system to pigs production. The study makes use of pig farmers to gather this information

RESEARCH PROCESS (thorough and clear description of all data gathering processes that will take place)

1 The study requires pig farmer to participate voluntarily.
2 The focus will be on description of pigs.
3 Respondents may be representative of any ethic group, age or gender
3 Basic demographic information will be required from participants
4 Pigs will be measured accordingly to determine their size.
5 There are no right or wrong answers and all opinions will be valued.
6 You do not need to prepare anything in advance.
7 All participants will be given the opportunity to express an opinion, or agree or disagree

CONFIDENTIALITY
The opinion of farmers viewed as strictly confidential, and only members of the research team will have access to the information. No data published in dissertation and journals will contain any information through which participant may be identified. Your anonymity is therefore ensured.

WITHDRAWAL CLAUSE
I understand that I may withdraw from the focus group at any time. I therefore participate voluntarily until such time as request otherwise.

POTENTIAL BENEFITS OF THE STUDY (brief as in the research proposal)

Study will contribute towards a better understanding of pig breeds and conservation strategies in Sekhukhune District and the entire country. The generated information will further contribute to academic knowledge and pig industry in relation to genetic and conservation of pig genetic resources. The outcome will further help government policy makers on the review of current policy that regulates the genetic and conservation of pig genetic resources.

INFORMATION (contact information of your supervisor)

If I have any questions concerning the study, I may contact the supervisor, Dr. Prinsloo, at the Department of Agriculture and animal Health, Florida Campus, Unisa, and Tel: 011 471 2167.

CONSENT

I, the undersigned ……..… (full name) have read the above information relating to the project and have also heard the verbal version, and declare that I understand it.

I have been afforded the opportunity to discuss relevant aspects of the project with the project leader, and hereby declare that I agree voluntarily to participate in the project.

I indemnify the university and any employee or student of the university against any liability that I may incur during the course of the project.

I further undertake to make no claim against the university in respect of damages to my person or reputation that may be incurred as a results of the project/trial or through the fault of other participants, unless resulting from negligence on the part of the university, its employees or students.

I have received a signed copy of this consent form

Signature of participant: .....

Signed at …… on ……

WITNESSES

1.....

2.....

QUESTIONNAIRE

CHARACTERIZATION AND CONSERVATION OF INDIGENIOUS PIG GENETIC RESOURCES

Date :……..

Enumerator :……

Name of respondent :……

Municipality :……

Village :……

Name of the farm/project :……

Respondent number :……

Farm type

Backyard	
Subsistence	
Emerging	

GPS reading

S	
E	

A. PERSONAL CHARACTERISTICS

Gender of respondent

Male	
Female	

Position of respondent in project

Owner	
Chairperson	
Beneficiary	
Worker	
Relative	

If family/relative what position in household

Father	
Mother	
Brother	
Sister	
Son	
Daughter	

Marital status of responsible person

Married	
Single	
Divorced	
Widowed	
Separated	

Age of responsible person

>65	
55 – 64	
45 – 54	
35 – 44	
25- 34	
15 – 24	
<14	
Don't know	

Highest education level attained?

None	
Std 1 – Std 6	
Std 7 – Std 10	
Diploma	
Degree	

Ethnic group

Venda	
Tsonga	
Sotho	
Ndebele	
Other (specify)	

Do you belong to any union?

Yes	
No	

Specify……

Do you belong to any producer organization?

Yes	
No	

Specify……

Have you received training?

Yes	
No	

What type of training?

Financial	
Production	
Marketing	
Other (specify)	

Specify……

Who provided that training?

For how long have you been involved in farming?

01-03	
03-05	
05-08	
<08	

Is pig farming your main source of income?

Yes	
No	

Entity of farm/project

Partnership	
Close corporation	
Sole proprietorship	
Company	
Cooperative	
Informal	

Land ownership

Owner	
Lease	
P.T.O	
Other	

Specify……

Number of members, age group and gender

Project Members	**Age Group**	**Male**	**Female**
	>65		
	55 – 64		
	35 – 54		
	25 – 34		
	15 – 24		
	5 – 14		
	<5		

Do you keep records?

Yes	
No	

If yes which record?

Financial record	
Breeding record	
Production record	
Other	

Specify……

B. PRODUCTION PRACTICES

What is your system of production?

Intensive	
Semi intensive	
Extensive	
Free range	

What is purpose for keeping pigs?

Sales	
Investment	
Meat	
Manure	
Culture	
Pets	
Others	

Specify……

Do you castrate your male piglets?

Yes	
No	

If yes what are reasons?

Control breeding	
Meat quality	
Temperament	
Market price	
Others	

Specify……

If yes, at what age do you castrate?

3 weeks	
4 weeks	
8 weeks	
12 weeks	
Other	

Specify……

How many numbers of different categories of pigs at your farm?

Boar	
Sow	
Weaners	
Piglets	

What has been the number of entries in the last 12 months?

Activity	**Piglets**	**Weaners**	**Male**	**Female**	**Total**
Born					
Bought					
Lent					
Donated					

What has been the number of exits in the last 12 months?

Activity	piglets	weaners	Male	Female	Total
Dead					
Sold					
Donated					
Exchange					
Stolen					
Slaughter					

Do you control external parasites?

Yes	
No	

If yes, what method of external pest control do you use?

Spray	
Pour-on	
Injection	
Traditional	
Other	

Specify……

Do you control internal parasites?

Yes	
No	

If yes, what method of internal parasites do you use?

Trench	
Injection	
Traditional	
Other	

Specify……

Do you vaccinate pigs?

Yes	
No	

Do you have access to veterinary services?

State Vet	
Private vet	
Drug supplier	
Extension service	
None	
Other	

Specify……..

C. HERD STRUCTURE

What type of housing do you use for your pigs?

Sty	
Yard	
Proper pig house	
Other(specify)	

Material used for housing

Material used		Form of house	
Untreated wood		Roof	
Treated wood		Solid wall	
Iron sheets		Floor	
Bricks		Concrete	
Mud		Wooden	
Wire		Earth	
Other		Other	

Specify……

Did you receive any financial assistance to build the house?

Yes	
No	

If yes, give the name of the funder(s).

1.
2.

What is source of water for the pigs?

Dam	
River	
Well	
Borehole	
Spring	
Municipal pipes	
Other	

Specify……

How many pens are there for the pigs?

Farrowing pens	
Dry pens	
Weaners pens	
Mating pens	

Do farrowing pens have farrowing crates?

Yes	
No	

Do you have heat source for piglets?

Yes	
No	

If yes, what kind of heating system do you use?

Heater	
Infrared	
Coal heater	
Other	

Specify……

D. FEED AND FEEDING

What type of feed do you use?

Complete ration	
Homemade ration	
Crushed grain	
Whole grain	
Kitchen waste	
Vegetables	

How many kilograms of feed do you give per pig?

	AM	PM
Sow		
Lactating sow		
Boar		
Weaner		
Piglet		

How many times do you feed pigs daily?

Once	
Twice	
Ad lib	
Not at all	

Where do you get feed for your pigs?

At what age do you wean the piglets?

3 weeks	
4 weeks	
5 weeks	
6 weeks	
No weaning	

What is the usual interval period from weaning to mating?

5 days	
21 days	
Not known	

E. BREEDING PRACTICES

Which pig breed(s) do you keep on your farm?

Breed	Local name	Quantity
Large white		
Landrace		
Duroc		
Windsnyer		
Kolbroek		
Other		

Specify……

What is trend of breed within flock?

Increasing	
Decreasing	
Stable	
Unknown	

Where did you obtain these breeds?

Commercial farm	
Communal farm	
Inherited	
Market	
Other	

Specify……

What are the mating methods practiced on the farm?

Uncontrolled mating	
Artificial Insemination	
Group mating	
Individual mating	
Other	

Specify……

What are breeding methods practiced?

Cross breeding	
Line breeding	
Inbreeding	
Other	

Specify……

Where are the boar used come from?

Borrowed	
Bought	
Own bred	
Donated	
Other	

Specify……

How many boars are used on the farm at a time?

01	
02	
03	
<04	

What is the mating season used?

Summer	
Winter	
Throughout the year	
Other	

Specify……

What are reasons for the choice of breeding boar?

Rank according to level of influence (1-high, 2-average, and 3-low)

	Tick	Rank
Size		
Conformation		
Colour		
Temperament		
Growth rate		
Fertility		
Disease tolerance		
Heat tolerance		
Other		

Specify……

What are the reasons for culling?

Rank (1-very important, 2-important, 3-not important)

	Male		**Female**	
	Tick	**Rank**	**Tick**	**Rank**
Size				
Shape				
Colour				
Temperament				
Health				
Body condition				
Performance				
Old age				
Poor fertility				
Other				

Specify……

F. MARKETING

Did you sell any pigs in the past 12 months?

Yes	
No	

If yes, where did you sell your pigs in past 12 months?

Auction	
Butcher	
Abattoir	
Speculator	
Agent	
privately	
Other(specify)	

Specify……

At which average weight did you sell the pigs?

30-40	
40-50	
50-60	
60-70	

What is the distance, in kilometres, to the market?

>30	
30-50	
50-70	
70-100	
<100	

How did you transport your pigs to the market?

Own Transport	
Hired Transport	
Shared Transport	
Other(specify)	

What was the average price per pig sold in last 12 months?

R500-R1000	
R1000-3000	
R3000-5000	
R5000-8000	
R<8000	

G. CONSERVATION METHODS

Rate your knowledge of awareness regarding the conservation of animal genetic resources

No knowledge		Minimal		Average		Well informed	

How do you value conservation of animal genetic resources?

Extremely important		Important		Not important	

What is value of indigenous pigs?

Extremely valuable		Moderately valuable		Not valuable	

What are the reasons for using exotic pig breeds?

Market	
Conformation	
Growth rate	
Size	
Temperament	
Fertility	
Disease tolerance	
Other	

What role do you play in the conservation of indigenous breeds?

…….

Are you aware of extinction of indigenous breeds?

Yes	
No	

Who has responsibility to conserve the indigenous breeds?

Rank accordingly (1-high, 2-Moderate, and 3-less)

	tick	**rank**
Government		
Community		
Communal farmers		
Commercial farmers		
Other(specify)		

H. PHENOTYPIC DESCRIPTION

Breed common name	
Pig identity no	
Farm/project name	

Coat description

Pattern	Uniform (1-colour	
	Uniform(2- colours	
	Pied	
	Spotted	

Coat Colour

White	
Black	
Brown	
Dark red	
Light red	
Grey	
Fawn	

Hair

Short	
Dense	
Sparse	
Long	
Straight	
Curly	

Hair on the legs

Present	
Absent	

Colour

If the pigs have more than one colour (1-Main colour, 2-moderate and 3-less)

Body Colour		**Rank**
	White	
	Brown	
	Black	
	Dark red	
	Light red	
	Grey	
	Fawn	

Body size

Chest girth	
Height withers	
Body length	
Pelvic width	
Body mass	

Head

Snout	Short	
	Medium	
	Long	

Tusk	Present	
	Absent	

Head length	

Profile

Face	Flat	
	Concave	
	Convex	

Back	Hallow	
	Straight	
Rump	Flat	
	Sloping	
	Roofy	

Shape	Pot belly	
	Lean	
	Roofy	

Ear

Size	Rudimentary	
	Medium	
	Large	

Orientation	Erect	
	Lateral	
	Drooping	

Ear length size	

Tail

Length	Short	
	Medium	
	Long	

Presentation	Straight	
	Curled	

Tail length size	

Teat

Teat type	Normal	
	Rudimentary	

Teat numbers	